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the sockets are also cast in iron. In these cases a mill-board annular washer, soaked in oil, is placed between the flat ends of the two pipes, which are screwed together by the double nut as in the former case.

DESCRIPTION OF AN IMPROVED CHAIN FOR CABLES, AND FOR MINING, AND OTHER PURPOSES.

THE novelty and improvement in Mr. Cutler's chain consist in having, on one moiety of the links composing the chain, hollow cylindrical projections, called pummels, and, on the other portion of the chain, cylindrical cups or sockets, which, when put together, form a joint working upon its axis or fulcrum, such axis being the pin passing through the hollow part of the pummels and sockets, giving, at the same time, much greater strength and durability, with less bulky joints than heretofore.

In all former chains of this description, the strength of the chain depended on the pin running through cylindrical holes in the ends of the links; this pin may be called the joint-pin, and is introduced through the ends of the links in the exact centre, and such pin is secured in its place, either by a head at one end and a screwed nut at the other, or by a head at one end and riveted at the other, and by this means the several links forming the breadth of the chain are kept together. It is clear from this that, the strength depending alone on the pin, if such pin were to break, the chain must separate. The cylindrical projections in Mr. Cutler's chain fitting into the cylindrical cavities or sockets obviate this; for if the pin passing through them and forming the axis were to break, the bearing of the cylindrical projections or pummels in the cylindrical cavities or sockets would afford a sufficient support, the chain being held in that position by a pin passing through the middle portion of the link, consequently the chain would not separate, the pummels forming a sort of pin of much greater strength than the real pin; and the pummels, cups or sockets, being perfectly cylindrical, the tendency of its component parts to lateral separation is very little, and the chain being so constructed, it can accommodate itself to any sinuosities, however irregular, which may at any time be required, and, in fact, very much more than it is even probable or possible may ever occur, as the links will traverse through an area of 180°, and this is much greater than will be at any time required.

The strength of this chain was tested against a piece of the chain now in regular use for mines, and both of the same weight, by Mr. William Tongue, Engineer, formerly an apprentice to the late James Watt, and for several years afterwards foreman of his works. The ordinary chain broke at a pressure of 15 tons, while Mr. Cutler's chain broke, through a flaw in one of the links, while sustaining 36 tons.

ON A PATENT TUBE FOR LOCOMOTIVE AND MARINE BOILERS.

By Mr. Job Cutler.

Tubes were first introduced into steam-engine boilers by M. Seguin; it has since been found that the cost of the original tubes, and also that of repairing them, has been excessive, and that every engine, according to Tredgold and our best authorities, has required to have the whole of the tubes removed and replaced by new ones about once in every two years; and this, exclusive of the tubes used in the intermediate time for repairing or replacing those tubes which, from being nearest the fire, had been worn out in one quarter the time of the others.

Mr. Cutler's tubes may be made of common iron, but he prefers that they should be made of what is termed best or charcoal iron, as they would be rendered easier to work and more durable. The tubes may be welded in the ordinary way, only, instead of making them (as iron tubes have heretofore been welded, for gas and other purposes) with a jump joint, he makes them with a lap-over joint, which presents a stronger resistance to the force of both fire and steam than does the former. After the tubes have been welded he inserts a bright steel mandril or triblet, and then draws them through a hole or wortel, commonly called a die or bed, and which is placed upon a draw-bench; the drawing is performed by the end of the tube being inserted through the hole or bed, and then grasped by a pair of pliers attached to an endless chain, and the motion being thrown on, it is drawn through in the usual way. The whole length of the mandril over which the tube is drawn does not pass through the hole or wortel, as in this case there might be a slight difficulty in extracting it, or, at least, it would occupy some time in so doing, but it is made stationary, with the triblet end passing a few inches through the hole or wortel, and the tube is drawn down and off the mandril. This process has the effect of straightening the tube, laying smooth any blister which may have risen upon the iron in its hot state, rendering it perfectly cylindrical, and laying the grain all one way, and rendering it closer, thereby increasing the consistency and durability of the tube. By this method, also, the tubes may be rendered bright, and have a polished appearance, or, after